UNIT III

LOAD FLOW ANALYSIS

FAST DECOUPLED METHOD

- J_2 & J_3 of Jacobian matrix are zero

$$\begin{bmatrix}\Delta P\\ \Delta Q\end{bmatrix}=\begin{pmatrix}J_1 & 0\\ 0 & J_4\end{pmatrix}\begin{bmatrix}\Delta\delta\\ \Delta|V|\end{bmatrix}$$

$$\Delta P = J_1\Delta\delta = \left[\frac{\partial P}{\partial\delta}\right]\Delta\delta$$

$$\Delta Q = J_4\Delta|V| = \left[\frac{\partial Q}{\partial|V|}\right]\Delta|V|$$

$$\frac{\Delta P}{\Delta|V_i|} = -B'\Delta\delta$$

$$\frac{\Delta Q}{\Delta|V_i|} = -B''\Delta|V|$$

$$\Delta\delta = -\left[B'\right]^{-1}\frac{\Delta P}{\Delta|V|}$$

$$\Delta|V| = -\left[B''\right]^{-1}\frac{\Delta Q}{\Delta|V|}$$

$$\delta_i^{k+1} = \delta_i^k + \Delta\delta^k$$

$$\left|V_i^{k+1}\right| = \left|V_i^k\right| + \Delta\left|V_i^k\right|$$

- This method requires more iterations than NR method but less time per iteration
- It is useful for in contingency analysis

COMPARISION BETWEEN ITERATIVE METHODS

Gauss – Seidal Method

1. Computer memory requirement is less.
2. Computation time per iteration is less.
3. It requires less number of arithmetic operations to complete an iteration and ease in programming.
4. No. of iterations are more for convergence and rate of convergence is slow (linear convergence characteristic.
5. No. of iterations increases with the increase of no. of buses.

NEWTON – RAPHSON METHOD

- Superior convergence because of quadratic convergence.
- It has an 1:8 iteration ratio compared to GS method.
- More accurate.
- Smaller no. of iterations and used for large size systems.

- It is faster and no. of iterations is independent of the no. of buses.
- Technique is difficult and calculations involved in each iteration are more and thus computation time per iteration is large.
- Computer memory requirement is large, as the elements of jacobian matrix are to be computed in each iteration.
- Programming logic is more complex.

FAST DECOUPLED METHOD

- It is simple and computationally efficient.
- Storage of jacobian matrix elements are60% of NR method
- computation time per iteration is less.
- Convergence is geometric,2 to 5 iterations required for accurate solutions
- Speed for iterations is 5 times that of NR method and 2-3 times of GS method

Thank You